


AUG 21 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	KLOEN <i>et al.</i>	Examiner:	Chu, Chris C.
Serial No.:	10/510,591	Group Art Unit:	2815
Filed:	October 8, 2004	Docket No.:	NL 020327 US
Title:	SEMICONDUCTOR DEVICE AND METHOD OF MANUFACTURING SAME		

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence and the papers, as described hereinabove, are being transmitted via facsimile-formal Entry, to the attention of the Examiner at Commissioner for Patents, MAIL STOP APPEAL BRIEF, P.O. Box 1450, Alexandria, VA 22313-1450, on August 21, 2006.

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By:   
Kelly S. WaltigneyAPPEAL BRIEF

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24738

Dear Sir:

This Appeal Brief is submitted pursuant to 37 C.F.R. §41.37, in support of the Notice of Appeal filed June 19, 2006 and in response to the rejections of claims 1-6 as set forth in the Final Office Action dated February 9, 2006, and in further response to the Advisory Action dated April 11, 2006.

Please charge Deposit Account number 50-0996 (VLSI.489PA) \$500.00 for filing this brief in support of an appeal as set forth in 37 C.F.R. §1.17(c). If necessary, authority is given to charge/credit Deposit Account 50-0996 (VLSI.489PA) additional fees/overages in support of this filing.

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**I. Real Party In Interest**

The real party in interest is the Assignee, Koninklijke Philips Electronics, N.V., headquartered in Eindhoven, the Netherlands.

**II. Related Appeals and Interferences**

While Appellant is aware of other pending applications owned by the above-identified Assignee, Appellant is unaware of any related appeals, interferences or judicial proceedings that would have a bearing on the Board's decision in the instant appeal.

**III. Status of Claims**

Claims 1-6 stand rejected and are presented for appeal; claims 7-12 were cancelled without prejudice; claim 13, added by way of amendment in the non-final Office Action Response mailed on November 14, 2005, has not been rejected and is assumed to be allowable. A complete listing of the claims under appeal is provided in an Appendix to this Brief.

**IV. Status of Amendments**

No amendments have been filed subsequent to the Final Office Action dated February 9, 2006. Appellant notes that the Advisory Action indicated that proposed amendments will not be entered; however, no amendments were made in the after-final Response. Discussion of any amendments as may be relevant to claim 13 is made in the Argument section below.

**V. Summary of Claimed Subject Matter**

The present invention relates to semiconductor devices, and more particularly, to arrangements and approaches to anchoring encapsulation material with a semiconductor device.

According to an example embodiment of the present invention, a semiconductor device includes a carrier (e.g., 30 of FIG. 1) with a first and a second side (e.g., 1 and 2) situated opposite to each other, with a first electroconductive layer (e.g., 12) on the first side (see, e.g., paragraph 033). The first electroconductive layer is patterned in accordance with a

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desired pattern, thereby defining a number of mutually isolated connection conductors separated by apertures (e.g., conductors 31, 32 and 33 separated by apertures 15 of FIG. 1 and paragraph 033). A semiconductor element (e.g., 20 of FIG. 1) is present on the first side of the carrier with connection regions (e.g., 21) that are electroconductively connected via connection means (e.g., 22) with the connection conductors of the carrier (*see, e.g.,* paragraph 033). The semiconductor element is encapsulated in a passivating envelope that extends as far as the second side of the carrier, but does not cover the second side of the carrier (*see, e.g.,* 40, extending into regions 15 of FIG. 1, and paragraph 034). Contact surfaces are defined in the connection conductors on the second side of the carrier for placement on a substrate. The envelope is mechanically anchored in the connection conductors, with the connection conductors having side faces with recesses to facilitate the anchoring (*see, e.g.,* FIG. 1 with regions 16, and paragraph 034, with the envelope extending into the first electroconductive layer and anchored with the electroconductive layer via the recesses).

**VI. Grounds of Rejection to be Reviewed Upon Appeal**

1. **Whether the rejection of claims 1-3 under 35 U.S.C. § 103(a) over Tsuji *et al.* (U.S. Patent No. 5,656,550) in view of Jung *et al.* (U.S. Patent No. 6,333,252) can stand when the cited references fail to teach or suggest all of the claim limitations, and where there is no motivation to modify the Tsuji reference.**
2. **Whether the rejection of claim 4 under 35 U.S.C. § 103(a) over Tsuji *et al.* (U.S. Patent No. 5,656,550) and Jung *et al.* (U.S. Patent No. 6,333,252), as applied to claim 1 and further in view of Rostoker (U.S. Patent No. 5,340,771) is proper.**
3. **Whether the rejection of claim 5 under 35 U.S.C. § 103(a) over Tsuji *et al.* (U.S. Patent No. 5,656,550) and Jung *et al.* (U.S. Patent No. 6,333,252), as applied to claim 2 above, and further in view of Osawa (U.S. Patent No. 6,077,727) is proper.**
4. **Whether the rejection of claim 6 under 35 U.S.C. § 103(a) over Tsuji *et al.* (U.S. Patent No. 5,656,550) and Jung *et al.* (U.S. Patent No. 6,333,252), as applied to claim 1 above, and further in view of Harada (U.S. Patent No. 6,091,144) is proper.**

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## **VII. Argument**

Before turning to the discussion of the grounds of rejection, the following addresses claim 13, which was added by amendment on November 14, 2005. Claim 13 was added in an amendment filed on November 14, 2005, which also included an amendment to the Abstract and Specification. Appellant notes that the aforesaid amendment to the abstract was indicated as non-compliant in a Notice of Non-compliant Amendment; however, there were no compliance issues indicated with any of the other amendments, including the amendment adding claim 13. Appellant submitted a response to this notice, which addressed the indication of non-compliance with the Abstract. The Final Office Action mailed on February 9, 2006 indicated that the November 14<sup>th</sup> amendment was received and entered. In view of this, Appellant understands that the amendment adding claim 13 was entered, that claim 13 has not been rejected and further that claim 13 is allowable.

**1. The Section 103 Rejections Of Claims 1-3 Must Be Reversed Because The Cited Tsuji Reference Does Not Teach Or Suggest The Claimed Limitations As Asserted By The Examiner, And Because There Is No Motivation To Modify The Tsuji Reference As Asserted.**

**A. The Section 103 Rejection Of Claims 1-3 Should Be Reversed Because The Tsuji Reference Does Not Teach Or Suggest All Of The Claimed Limitations As Suggested.**

The claim rejections must be reversed because the Examiner's assertion that the resin 23 is mechanically anchored in the frame terminal 27 is in clear contrast to the cited figures and discussion in the Tsuji reference, and further because the asserted first electroconductive layer (62) is not patterned to define isolated connection conductors having anchoring recesses.

Beginning with the location of Tsuji's encapsulation, the resin 23 is formed over a semiconductor chip 41, well after the formation of underlying layers using a common encapsulation approach. No portion of the resin 23 extends to any conductors in the substrate underlying the chip 41, and there is no mechanical anchoring of the resin 23 in the substrate. As is clearly described by Tsuji, any insulating portions formed in the substrate, including portion 51a discussed in the Advisory Action, are formed before the positioning of the chip

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41 and, accordingly, before the formation of any resin 23 to encapsulate the chip. *See, e.g.,* column 17, lines 20-34. In this regard, the Tsuji reference does not teach or suggest a passivating envelope (alleged as the resin 23) anchored in connection conductors (alleged as the frame terminal 27).

In response to earlier arguments discussing improprieties with the claim rejections as generally discussed in the previous paragraph, the Examiner has suggested in the Advisory Action (for the first time) that the resin 23 is anchored by the recesses 64 because the resin is "part of" the insulating layer 51a. In alleged support of this assertion, the Examiner relies upon a single sentence at lines 66-67 of column 15 in the Tsuji reference that states that "insulating layer 51a ... constitutes a part of the resin portion 23." Applicant submits that this cited portion of the Tsuji reference fails to describe that the resin 23, which encapsulates the chip 41, is anchored in conductors underlying the chip and other intervening layers. That is, while Tsuji makes the statement as cited by the Examiner, it fails to describe any embodiment where the resin 23 and the insulating layer 51a are coupled in any manner, much less in a manner that would facilitate the anchoring of the resin 23 by the frame terminal 27.

As discussed above, in all embodiments described by Tsuji, the resin 23 is formed several steps after the formation of the insulating layer 51a as consistent with FIGS. 21a-21c and as described in column 17, with layers 51b, 52 and the chip 41 itself separating the insulating layer and the resin. Much of the insulating layer portion 51a is not only below layers 51b and 52, it is also below the chip 41; the Examiner has not shown, nor does the Tsuji reference teach, any application where the resin 23 can be formed after these portions, yet also below these portions. Rather, the Tsuji reference describes the semiconductor device 21G formed in accordance with FIGS. 21A, 21B and 21C, in which the first insulating layer 51a is formed, several steps prior to the formation of the encapsulating resin 23. Tsuji's anchoring effect relative to the first insulation material 51a is to mitigate separation of the pole terminals, with no discussion whatsoever of any problem relative to the anchoring of the resin portion 23. The Tsuji reference therefore teaches away from the Examiner's assertion that the resin 23 is somehow contiguous with and anchored via the insulating layer 51a; at best, the discussion at lines 66-67 of column 15 appears to suggest that the materials 51a and 23 are both resin, or are separate parts of resin in the shown structure. This is consistent with

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Tsuji's use of common reference indicia for different parts (*e.g.*, with all pole terminals indicated as "28A" while the pole terminals are clearly separate). In short, the cited portions of the Tsuji reference do not teach or suggest the claimed limitations directed to an anchored encapsulation in any embodiment, enabled or otherwise.

Turning to the Examiner's recitation of metal layer 62 as the claimed "first electroconductive layer," the Examiner has not shown or even suggested that this metal layer 62 is patterned to define isolated connection conductors with recessed side faces as claimed. Rather, the Examiner first cites metal layer 62 as a carrier 60 (FIG. 20A) and as corresponding to the claimed first electroconductive layer; the Examiner then confusingly cites a frame terminal 27 as the claimed connection conductors. However, the frame terminal 27 connects the different patterned portions of the metal layer 62 (*see, e.g.*, FIG. 20C) and is not isolated via the patterned metal layer 62. That is, instead of showing correspondence between the metal layer 62 and the claimed limitations, the Examiner has asserted that frame terminal 27 corresponds to limitations directed to recessed connection conductors. The metal layer 62 is not arranged to define isolated connection conductors with recessed side faces to provide any anchoring of the resin 23. In this regard, the Examiner has not shown a "first electroconductive layer" in accordance with the claimed limitations.

**B. The Section 103 Rejection Of Claims 1-3 Should Be Reversed Because There Is No Motivation To Modify The Tsuji Reference.**

As the Examiner acknowledged in the Final Office Action, the Tsuji reference does not disclose a bottom surface of a passivating envelope extending as far as a second side of a carrier. The Examiner's attempt to modify the Tsuji reference would improperly remove aspects of the Tsuji reference that relate to the location of its various insulating (*i.e.*, passivating) materials. Specifically, there is no motivation to modify the Tsuji reference so that its insulation material extends to a second side of a carrier because such modification would remove the purpose of the Tsuji reference. For instance, referring to FIG. 21A, extending the insulation material 51a to the second side as suggested by the Examiner would remove the thin portion 66 of the frame terminal 27. This thin frame terminal portion 66 holds the frame terminal 27 together during processing until the insulating material 51a is

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formed (see, e.g., lines 7-19 of column 17). Furthermore, the thin frame terminal portion 66 facilitates the anchoring of the terminals (28A) by the insulating material 51a, by holding the insulating material in place during fabrication; removing the thin frame terminal portion 66 further frustrates this purpose. As indicated in M.P.E.P. §2143.01, where a proposed modification would render a cited reference unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification (citing *In re Gordon*, 733 F.2d 900 (Fed. Cir. 1984)). In this regard, there is no motivation for modifying the Tsuji reference with Jung or otherwise, such that its insulation material 51a extends to a second side (e.g., outer layer 63). Therefore, the Section 103 rejections are improper and must be reversed.

**2. The Section 103 Rejection Of Claim 4 Must Be Reversed Because The Cited Tsuji Reference Does Not Teach Or Suggest The Claimed Limitations As Suggested By The Examiner, And Because There Is No Motivation To Modify The Tsuji Reference As Asserted.**

The rejection of claim 4 must be reversed for the reasons stated above in connection with the rejection of independent claim 1, from which claim 4 depends. Specifically, where an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is also nonobvious. See, e.g., *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Here, the rejection of claim 4 fails because the cited references fail to teach or suggest all of the limitations in claim 1, and further because the proposed modification of the primary Tsuji reference is unmotivated, as discussed above.

The rejection of claim 4 must also be reversed because the Examiner has failed to cite any evidence of motivation for modifying Tsuji to include the bumps of Rostoker. Instead of citing any evidence, the Examiner simply states that one of skill in the art would be motivated to make the modification "to increase the number of I/O connection." However, the Examiner has failed to provide any evidence of motivation as to why such an increase is desirable, or even plausible, with the Tsuji reference. In this regard, the rejection of claim 4 should also be reversed because there is no motivation for modifying the Tsuji reference.

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**3. The Section 103 Rejection Of Claim 5 Must Be Reversed Because The Cited Tsuji Reference Does Not Teach Or Suggest The Claimed Limitations As Suggested By The Examiner, And Because There Is No Motivation To Modify The Tsuji Reference As Asserted.**

The rejection of claim 5 must be reversed for the reasons stated above in connection with the rejection of independent claim 1, from which claim 5 depends. Specifically, where an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is also nonobvious. *See, e.g., In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Here, the rejection of claim 5 fails because the cited references fail to teach or suggest all of the limitations in claim 1, and further because the proposed modification of the primary Tsuji reference is unmotivated, as discussed above.

**4. The Section 103 Rejection Of Claim 6 Must Be Reversed Because The Cited Tsuji Reference Does Not Teach Or Suggest The Claimed Limitations As Suggested By The Examiner, And Because There Is No Motivation To Modify The Tsuji Reference As Asserted.**

The rejection of claim 6 must be reversed for the reasons stated above in connection with the rejection of independent claim 1, from which claim 6 depends. Specifically, where an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is also nonobvious. *See, e.g., In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Here, the rejection of claim 6 fails because the cited references fail to teach or suggest all of the limitations in claim 1, and further because the proposed modification of the primary Tsuji reference is unmotivated, as discussed above.

The rejection of claim 6 must also be reversed because the replacement of the metal carrier in the Tsuji reference with the layered carrier in the Harada reference would render the pole terminals 28a non-conductive and unsatisfactory for their purpose. Specifically, referring to FIG. 21C in the Tsuji reference as cited by the Examiner, adding an insulative layer to the terminals 28A in a manner commensurate with that shown in Harada would insulate the upper (62) and lower (63) connectors. Therefore, the Tsuji reference would not function when modified as suggested by the Examiner. As indicated in M.P.E.P. §2143.01, where a proposed modification would render a cited reference unsatisfactory for its intended



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purpose, then there is no suggestion or motivation to make the proposed modification (citing *In re Gordon*, 733 F.2d 900 (Fed. Cir. 1984)). In this regard, there is no motivation for modifying the Tsuji reference to include insulating layers in its conductor terminals. Therefore, the Section 103 rejections are improper and must be reversed.

#### **VIII. Conclusion**

In view of the above, Appellant submits that the rejections of claims 1-6 are improper. Appellant therefore requests reversal of the rejections as applied to the appealed claims and allowance of the entire application.

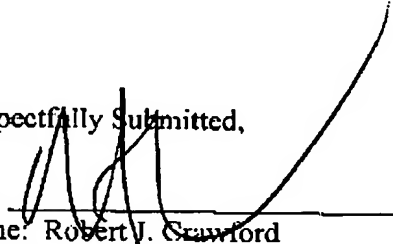
Authority to charge the undersigned's deposit account was provided on the first page of this brief.

Should there be any issues that could be readily addressed over the telephone, the Examiner is asked to contact the agent overseeing the application file, Mr. Peter Zawilski, of Philips Corporation at (408) 474-9063.

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Respectfully Submitted,

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**APPENDIX OF CLAIMS INVOLVED IN THE APPEAL**  
(S/N 10/510,591)

1. *(Previously Presented)* A semiconductor device comprising a carrier with a first and a second side situated opposite to each other, which carrier has a first electroconductive layer on the first side, the first electroconductive layer is patterned in accordance with a desired pattern, thereby defining a number of mutually isolated connection conductors separated by apertures,

on which first side of the carrier a semiconductor element is present, which semiconductor element is provided with connection regions that are electroconductively connected via connection means with the connection conductors of the carrier, which semiconductor element is encapsulated in a passivating envelope that extends as far as the second side of the carrier, but does not cover the second side of the carrier;

on which second side, contact surfaces are defined in the connection conductors for placement on a substrate,

characterized in that the envelope is mechanically anchored in the connection conductors, for which purpose the connection conductors are provided with side faces having recesses.

2. *(Original)* A semiconductor device as claimed in claim 1, characterized in that, in addition to the first layer, the carrier comprises a second layer and a third layer, the second layer comprising a material that can be etched in an etchant that leaves the first and the third layer substantially in tact.

3. *(Previously Presented)* A semiconductor device as claimed in claim 1, characterized in that the apertures extend as far as the second side of the carrier.

4. *(Original)* A semiconductor device as claimed in claim 1, characterized in that the connection means are bumps, which bumps are also used to attach the semiconductor element onto the carrier.

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5. *(Original)* A semiconductor device as claimed in claim 2, characterized in that the first and the third layer contain copper, and the second layer contains a material selected from the group composed of Al and Ni-Fe.

6. *(Previously Presented)* A semiconductor device as claimed in claim 1, characterized in that the carrier comprises a number of electrically insulating and conductive layers, at least one passive component being embedded in said layers.

7. - 12. *(Cancelled)*.

13. *(Previously Presented-assumed Allowable)* The semiconductor device of Claim 1, further comprising a substrate upon which the second side of the carrier is disposed.

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### **APPENDIX OF EVIDENCE**

Appellant is unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

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### **APPENDIX OF RELATED PROCEEDINGS**

As stated in Section II above, Appellant is unaware of any related appeals, interferences or judicial proceedings.